Practice Exercises for Section 10.4

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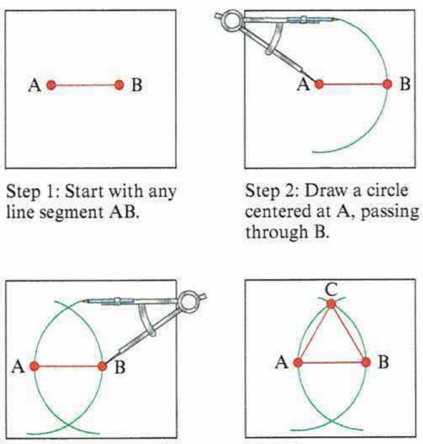
5. Figure 10.76 shows a method for constructing an equilateral triangle. Explain why this method must always produce an equilateral triangle.



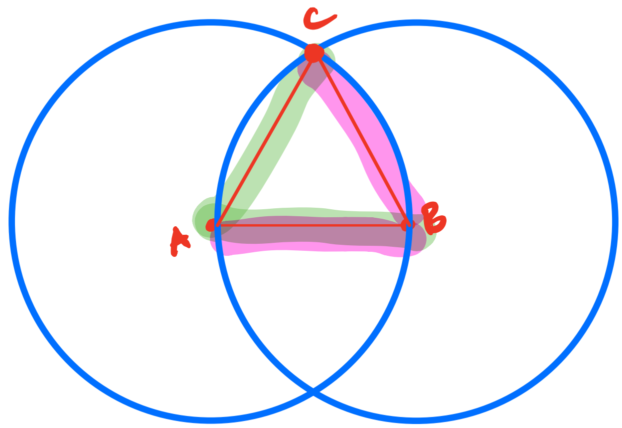
Step 1: Start with any line segment AB.

Step 2: Draw a circle centered at A, passing through B.

Step 3: Draw a circle centered at B, passing through A.

Step 4: Label one of the t points where the circles meet C. Connect A, B, and C with line segments.

Figure 10.76 Constructing an equilateral triangle.



How do we know ABC is equilateral?
(How do we know all the sides are the same length?)

We know AB = AC because they are radiuses of the same circle (B and C are on the same circle centered at A)

We know AB = BC because they are radiuses of the same circle (A and C are on the same circle centered at B).

Since BC = AB = AC, the triangle ABC is equilateral.

6. Use a ruler and a compass to construct a triangle that has one side of length 3 inches, one side of length 2 inches, and one side of length 1.5 inches. Describe your method, and explain why it must produce the desired triangle.

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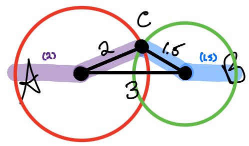
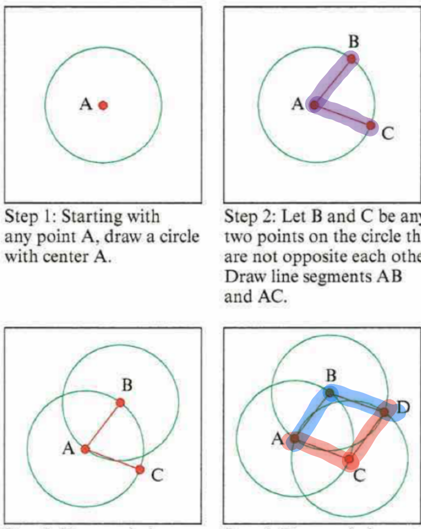


Lets put C 2 inches from A.
so we'll make a circle
of radius __2__
centered at __A__

Lets put C 1.5 inches from B
so we'll make a circle
of radius __1.5__
centered at __B__

7. Use the definition of circles and rhombuses to explain why the quadrilateral ABDC produced by the method of Figure 10.77 must necessarily be a rhombus.



Step 1: Starting with any point A, draw a circle with center A.

Step 2: Let B and C be any two points on the circle that are not opposite each other. Draw line segments AB and AC.

Step 3: Draw a circle centered at B and passing through A.

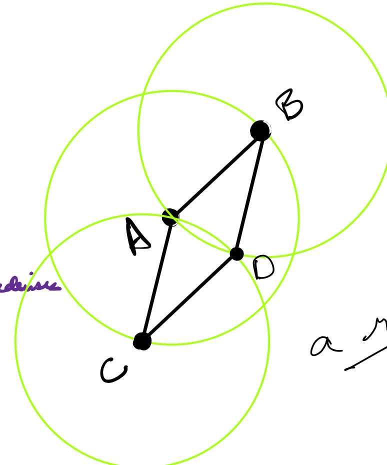
Step 4: Draw a circle centered at C and passing through A. Label the point other than A where these last two circles meet D. Draw line segments BD and CD.

Figure 10.77 Method for constructing rhombuses.

AB = AC
because theyre radiuses

AB = BD

AC = CD



a rhombus

So BD = AB = AC = CD

All sides equal,
so the quadrilateral is a rhombus

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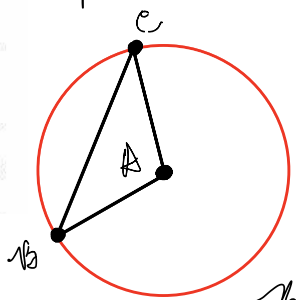
5. Figure 10.85 shows a method for constructing isosceles triangles.

a. Use the method of Figure 10.85 to draw two different isosceles triangles.

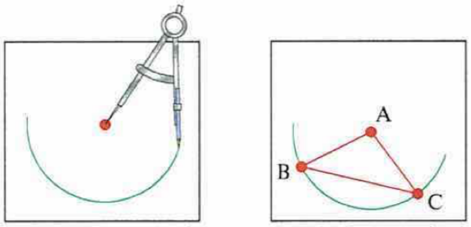
b. Use the definition of circles to explain why this method will always produce an isosceles triangle. Making the center one vertex of the triangle

c. Use this method to draw an isosceles triangle that has two sides of length 6 inches and one side of length 4 inches.



How do we know 2 sides have equal length?

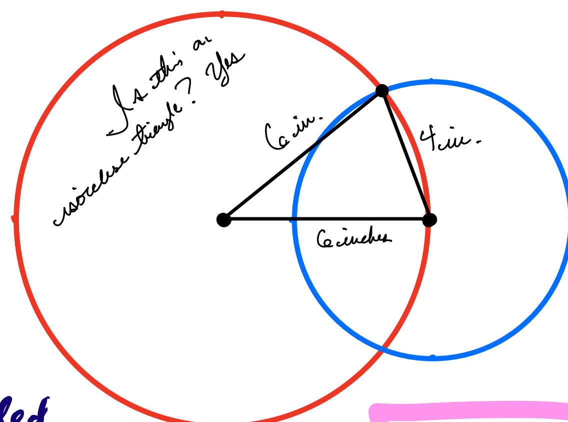
Because A is in the middle, so AB, AC are radiuses of the same circle.



Step 1: Draw part of a circle.

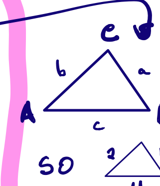
Step 2: Connect the center of the circle with two points on the circle.

Figure 10.85 A method for constructing isosceles triangles.



Secretly teaches something called the triangle inequality

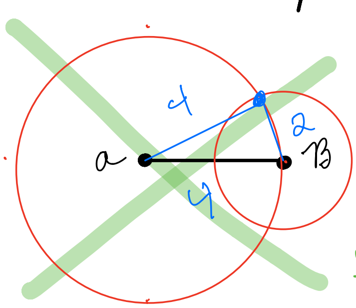
9. Is there a triangle that has one side of length 4 inches, one side of length 2 inches, and one side of length 1 inch? Explain. No, the 1-inch circle does



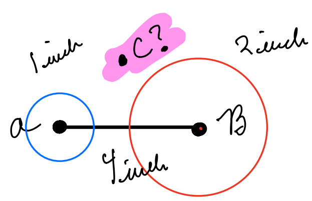
If the △ exists, then $b+a>c$

so 2, 1, 4 does not exist!

If there were such a triangle, we would be able to construct it with and ruler. Let's try...



That's a different triangle.



but the point C doesn't exist, so the triangle cannot be constructed

(the triangle does not exist)